## ELECTRONIC DEVICES WITH BARRIER FILM AND PROCESS FOR MAKING SAME

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Patent Number:	WO0011721
Publication date:	2000-03-02
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Requested Patent:	□ <u>WO0011721</u>
Application Number:	WO1999US16719 19990818
Priority Number(s)	US19980137083 19980820; US19980137084 19980820; US19980137085 19980820; US19980137086 19980820; US19980137087 19980820; US19980137088 19980820; US19980137089 19980820; US19980215127 19981218; US19980215128 19981218
IPC Classification:	H01L29/43, H01L21/441
EC Classification:	H01L21/768C3, C23C14/02B2, C23C14/18, C23C16/02H2, C23C16/14
EC Classification:	H01L21/768C3; C23C14/02B2; C23C14/18; C23C16/02H2; C23C16/14

EP1114464 (WO0011721)

Equivalents:

## Abstract

A semiconductor device having a barrier film (47) comprising an extremely thin film formed of one or more monolayers each comprised of a two-dimensional array of metal atoms. In one exemplary aspect, the barrier film (47, 49) is used for preventing the diffusion of atoms of another material (45) such as copper conductor, into a substrate (46), such as a semiconducting material or an insulating material, and an oxide layer (48). Methods for making the barrier film (47) in a semiconductor device are also covered. The extremely thin barrier film (47, 49) makes possible a significant increase in the component density and a corresponding reduction in the number of layers in large scale integrated circuits, as well as improved performance.